

## Claims

We claim:

- 5           1.    A direct chip attach structure comprising:  
              a support substrate having a first major surface;  
              an electronic chip coupled to the first major surface,  
wherein the electronic chip includes a bond pad on an outer  
              surface;  
10           a conductive stud coupled to the bond pad;  
              a protective layer covering said electronic chip and a  
portion of the first major surface, wherein the protective  
layer has an opening to expose the conductive stud;  
              a barrier layer formed on the conductive stud; and  
15           a solder ball coupled to the barrier layer.
2.    The structure of claim 1 wherein the barrier layer  
comprises nickel.
- 20           3.    The structure of claim 2 wherein the barrier layer  
has a thickness of approximately 2 microns to approximately  
7 microns.
4.    The structure of claim 1 wherein the conductive  
25           stud comprises gold.
5.    The structure of claim 1 wherein the support  
substrate comprises a metal lead frame having a flag.
- 30           6.    The structure of claim 5 wherein the metal lead  
frame and flag comprise copper.

7. A method for forming an electronic package comprising the steps of:

attaching an electronic chip to a support substrate, wherein the electronic chip includes a bond pad on an outer surface;

attaching a conductive stud to the bond pad;

encapsulating the electronic chip to form a sub-assembly having an upper surface;

forming an opening in the upper surface to expose the conductive stud;

forming a barrier layer on the conductive stud; and

attaching a solder bump to the barrier layer.

8. The method of claim 7 wherein the step of forming the barrier layer includes forming a nickel barrier layer.

9. The method of claim 7 wherein the step of forming the barrier layer comprises the steps of:

placing the sub-assembly in an electroless plating bath; and

injecting plating solution towards the opening to form the barrier layer on the conductive stud.

10. The method of claim 9 further comprising the step of agitating the electroless plating bath.

11. The method of claim 9 wherein the step of placing the sub-assembly includes placing the sub-assembly in an electroless nickel plating solution.

12. The method of claim 9 further comprising the step of masking the support substrate.

13. The method of claim 7 wherein the step of attaching the conductive stud includes attaching a gold stud.

5 14. A method for forming a direct chip attach device comprising the steps of:

providing a sub-assembly comprising a lead frame, a chip attached the lead frame, a bond pad formed on an outer surface of the chip, a conductive bump attached to the bond  
10 pad, and an encapsulating layer covering the chip, wherein the encapsulating layer has an opening to expose the conductive bump;

placing the sub-assembly in an electroless plating solution; and

15 injecting electroless plating solution towards the opening to form a barrier layer on the conductive bump.

15. The method of claim 14 further comprising the step of covering exposed portions of the lead frame with a  
20 masking layer.

16. The method of claim 14 wherein the step of placing the sub-assembly includes placing the sub-assembly in an electroless nickel plating bath.  
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17. The method of claim 14 further comprising the step of coupling a solder bump to the barrier layer.

18. The method of claim 14 further comprising the step  
30 of agitating the electroless plating solution.

19. A plating apparatus for forming an electronic device comprising:

5 a bath for holding a plating solution and the electronic device; and  
an injecting device for directing a stream of plating solution towards the electronic device.

20. The plating apparatus of claim 19 further  
10 comprising an agitating device.